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Forest Service

**Intermountain
Region**

Forest Insect and Disease Conditions in the Intermountain Region 1991

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PHOTOGRAPHER: K. Andrew Knapp
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COVER STORY: A portion of the over 200,000 acres of Douglas-fir tussock moth defoliation on the Boise National Forest in Idaho is pictured. Defoliation of Douglas-fir, subalpine fir, and white fir caused by the Douglas-fir tussock moth was detected in several widely scattered areas within the Intermountain Region. Defoliation will likely result in tree mortality, top-kill, and growth reduction.

FOREST INSECT AND DISEASE CONDITIONS

in the

Intermountain Region

1991

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INTRODUCTION

This report briefly summarizes the status of insect and disease pests of forest trees in the Intermountain Region. Status of insects is based largely on annual and special aerial detection surveys which are conducted over 14,000,000 acres of forested lands. Status of diseases is based largely on ground observations and surveys.

General insect and disease information is summarized in the Résumé of Conditions.

Numbers of trees killed by major bark beetles and acreage of defoliating insect activity are displayed in Tables 1 through 11. Estimates are based on aerial survey information. General location of major insect activity is shown in Figures 1 through 10.

Recent publications are listed to aid the reader in locating specific, recent pest information of interest.

RÉSUMÉ OF CONDITIONS

Mountain pine beetle activity increased during 1991 but remains at comparatively low levels. Approximately 33,700 dying trees were detected this year compared to 11,900 trees in 1990. The largest infestation is located on the Sawtooth National Recreation Area in Idaho where 12,000 lodgepole pine were killed. On the Boise, Challis, and Targhee National Forests in Idaho, smaller, less extensive infestations occur in mostly lodgepole pine. In western Wyoming, increasing mortality of lodgepole and whitebark pine was detected on the Bridger-Teton National Forest. Decreasing mountain pine beetle activity in ponderosa pine was noted on the Dixie and Manti-LaSal National Forests in southern Utah.

Significant reductions in spruce beetle caused tree mortality occurred with 41,500 trees killed in 1991 compared to 194,400 trees killed in 1990. This reduction is attributable to the collapse of the massive spruce beetle outbreak on the Payette National Forest in Idaho. Elsewhere in the Region, spruce beetle activity increased. In Utah, spruce mortality increased on the Manti-LaSal National Forest; small, isolated infestations were noted on the Wasatch-Cache National Forest; and a new, potentially explosive infestation was detected on the Dixie National Forest. Activity on the Bridger-Teton National Forest in western Wyoming increased from previously low levels.

Douglas-fir beetle activity decreased throughout most of the Region: in 1990, 178,400 trees were killed; while in 1991, 89,800 trees were killed. In southern Idaho, on the Caribou National Forest, Douglas-fir beetle caused tree mortality plummeted with 2,400 trees killed in 1991 compared to 42,000 trees in 1990; on the Boise National Forest, tree mortality decreased from 62,400 trees in 1990 to 27,900 trees in 1991. Elsewhere in southern Idaho, mortality caused by Douglas-fir beetle decreased on the Challis, Payette, and Salmon National Forests but increased on the Targhee National Forest in eastern Idaho. In Utah, significant decreases in mortality occurred on the Manti-LaSal and Wasatch-Cache National Forests; while in western Wyoming, moderate decreases in mortality occurred on the Bridger-Teton National Forest.

Western pine beetle populations continued to collapse on the Boise and Payette National Forests in Idaho. Approximately 8,200 dying second-growth ponderosa pine trees were detected in 1991 compared to 23,800 trees in 1990 and 53,200 in 1989. Ips beetle attacks were frequently intermixed with western pine beetle activity. Western pine beetle activity was not detected elsewhere in the Region.

Massive increases in western balsam bark beetle activity occurred throughout the Region. Approximately 244,400 subalpine fir were killed during 1991, the largest western balsam bark beetle infestation ever recorded in the Region. The most extensive mortality occurred on the the Bridger-Teton National Forest in western Wyoming where 84,500 trees were killed. In Idaho, large outbreaks are located on the Caribou, Sawtooth, and Targhee National Forests while smaller infestations occur on the Boise, Challis, Salmon, and Payette National Forests. Significant mortality occurred throughout the host type on the Manti-LaSal and Wasatch-Cache National Forests in Utah.

Fir engraver beetle continued to cause extensive mortality of true fir trees throughout the Region with 249,400 dying trees detected, currently the largest bark beetle outbreak in the Region. Most of the activity was located on the Toiyabe National Forest in western Nevada where 193,000 red and white fir were killed. In Utah, mortality of white fir on the Wasatch-Cache National Forest increased significantly from past years. Mortality of grand fir in southern Idaho increased on the Payette National Forest and decreased on the Boise National Forest.

Mortality of Jeffrey pine by the Jeffrey pine beetle on the Toiyabe National Forest in western Nevada increased within the Tahoe Basin. Elsewhere on the Forest, decreasing mortality levels were noted.

Defoliation of Douglas-fir and true fir by western spruce budworm remained relatively static with 49,300 acres visibly defoliated during 1991 compared to 42,900 acres in 1990. All aerially visible defoliation was located in southern Idaho. The largest infestation, located on the Salmon National Forest, covers 46,200 acres. Elsewhere, 2,200 and 900 acres of defoliation were recorded on the Challis and Targhee National Forests, respectively. Ground surveys detected very light defoliation within the Beaver River drainage on the Fishlake National Forest in southern Utah.

Conifers on approximately 316,900 acres were defoliated by Douglas-fir tussock moth in Idaho and Utah. This was the largest acreage of Douglas-fir tussock moth defoliation ever recorded in the Region. In Idaho, 312,000 acres of defoliation were recorded on the Boise, Payette, and Sawtooth National Forests. Additionally, on Bureau of Land Management and State lands east of Bellevue and in the Owyhee Mountains south of Boise, considerable defoliation was mapped. In Utah, 4,900 acres of defoliation were mapped on the Wasatch-Cache National Forest and adjacent State land.

The largest infestation is located on the Boise National Forest and contiguous areas of the Sawtooth National Forest where primarily Douglas-fir is infested. Elsewhere on the Boise National Forest, extensive areas of grand fir on the Emmett Ranger District were visibly defoliated. Visible defoliation was not observed on Bald Mountain near Sun Valley, Idaho; however, higher than normal populations of the insect were detected during ground surveys. On the Payette National Forest, 18,500 acres of Douglas-fir and grand fir were defoliated in a unique infestation consisting of both Douglas-fir tussock moth and western spruce budworm. Subalpine fir, Douglas-fir, and white fir on the Wasatch-Cache National Forest were defoliated at elevations of 8,000 to 8,500 feet; one of the highest elevation Douglas-fir tussock moth infestations recorded. Defoliation levels, based on the percent of the tree crown displaying larval feeding damage, were generally very heavy throughout the Region.

This year was the third consecutive year of the Utah Gypsy Moth Eradication Program which included quarantine of infested areas, pheromone trapping, and aerial insecticide application. During 1988, two viable gypsy moth populations were detected in a residential area of Salt Lake City. As a result, 1,198 acres were treated during 1989 with three aerial applications of the biological insecticide *Bacillus thuringiensis* (*B.t.*). Intensive pheromone trapping to delimit the extent of the infestation was conducted with populations discovered in Bountiful and Provo. An additional 20,064 acres and 29,925 acres received three aerial applications of *B.t.* in 1990 and 1991, respectively. Each of the three annual treatments reduced male moth populations by 90 percent. Additionally, mass pheromone trapping has been conducted within each infested area to further reduce and delimit population levels. Eight areas will be treated in 1992, totaling 15,718 acres.

Multiagency gypsy moth monitoring occurred in all states encompassed by the Intermountain Region. Gypsy moths were detected in pheromone-baited traps in Wendell and Rigby, Idaho. No moths were caught in Nevada and Wyoming.

Because of the difficulty in aerially detecting visible symptoms, detection and monitoring of most forest pathogens is accomplished via ground surveys. Activity of many disease agents is reported only in general terms because of the sporadic and short duration of most foliar pathogens and the relatively static nature of root, stem, and branch pathogens and the difficulty in assessing change. Since this report reflects the change in pest status from year to year, disease information is frequently ommited unless a significant change has occurred. It should not be construed that forest diseases are absent or unimportant within the Region. In fact, they likely cause more direct mortality and growth loss than do insect pests.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Boxelder leafroller *Calaoptilia negundella*	Boxelder	Idaho	Scattered boxelder trees along the Salmon River in the vicinity of Salmon, Idaho, were infested with this leafroller.
Cooley spruce gall adelgid *Adelges cooleyi*	Spruce	Idaho, Utah, Wyoming	This adelgid was found in forested stands and ornamental trees throughout the Region; impact appeared greatest in ornamental trees.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Idaho, Utah, Wyoming	Mortality decreased considerably with 89,800 trees killed by the beetle in 1991 compared to 178,400 trees killed in 1990. In southern Idaho, 80,400 trees were killed: significant decreases in mortality occurred on the Boise, Caribou, Challis, and Salmon National Forests; moderate decreases in mortality occurred on the Payette and Sawtooth National Forests; and increasing mortality was observed on the Targhee National Forest. In Utah, 900 trees were killed, a significant reduction from previous levels: static levels of mortality were observed in the Book Cliff area in central Utah while significant reductions in tree mortality occurred on the Manti-LaSal and Wasatch-Cache National Forests. Moderate decreases in tree mortality, totaling 8,500 trees killed, occurred on the Bridger-Teton National Forest in western Wyoming.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir, True firs	Idaho, Utah	Defoliation increased from 53,000 acres in 1990 to 316,900 acres in 1991. This is the most defoliation caused by Douglas-fir tussock moth ever recorded in the Region. In Idaho, 312,000 acres of defoliation were detected on the Boise National Forest and contiguous areas of the Sawtooth National Forest, on the Payette National Forest, and throughout the Owyhee Mountains. In northern Utah, 4,900 acres of defoliation were detected on the Wasatch-Cache National Forest. Average defoliation intensity was classified as moderate to heavy.
Fir engraver beetle *Scolytus ventralis*	Grand fir, White fir, Red fir	Idaho, Utah, Nevada, California	Mortality increased significantly with 249,400 trees killed in the Region. In Nevada, 193,000 trees were killed on the Toiyabe National Forest and virtually all susceptible host type is infested. In Utah, 43,700 trees were killed and increasing mortality was observed on the Wasatch-Cache National Forest. In southern Idaho 12,700 trees were killed with increasing mortality noted on the Payette National Forest and decreasing mortality noted on the Boise National Forest.
Ips pilifrons	Spruce	Utah	Moderate infestations of this insect were found on the Pine Valley Ranger District, and heavy infestations were found in Peterson Grove on the Teasdale Ranger District, Dixie National Forest.
Jeffrey pine beetle *Dendroctonus jeffreyi*	Jeffrey pine	Nevada, California	Increasing tree mortality attributed to Jeffrey pine beetle occurred in the Lake Tahoe Basin on the Toiyabe National Forest in western Nevada, however Forestwide mortality decreased to 2,900 trees.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Large aspen tortrix *Choristoneura conflictana*	Aspen	Utah	Defoliation was observed near Big Lake, Hancock Flat, and Daniels Canyon on the Fishlake National Forest in Utah.
Mountain mahogany looper *Anacamptodes clivinaria profanta*	Mountain mahogany	Nevada	Mountain mahogany were defoliated by this looper in the McDonald Creek drainage of the Mountain City Ranger District, Humboldt National Forest.
Mountain pine beetle *Dendroctonus ponderosae*	Lodgepole pine, Ponderosa pine	Idaho, Utah, Wyoming	Increases in mortality occurred Regionwide, however mortality continues to remain at historically low levels. In 1990 approximately 11,900 trees were killed while during 1991 33,700 dying trees were observed. In southern Idaho, 30,400 fading trees were observed: in the largest infestation, located on the Sawtooth National Recreation Area, 12,000 trees were killed; elsewhere increases in mortality occurred on the Boise, Challis, Payette and Targhee National Forests, while decreases in mortality occurred on the Salmon National Forest. In Utah 1,600 trees were killed with decreases in mortality occurring on the Dixie and Manti-LaSal National Forests. On the Bridger-Teton National Forest in western Wyoming, 1,700 trees were killed, an increase in mortality from 1990.
Oyster shell scale *Lepidosaphes ulmi*	*Populus* spp.	Utah	Heavy populations infesting cottonwoods and aspen, were located in Ranch Canyon on the BLM Beaver Resource Area near Milford, Utah. Damage was variable ranging from single branch to tree mortality.
Pine engraver beetle *Ips pini*	Lodgepole pine, Ponderosa pine	Idaho, Utah, Nevada	This insect, often associated with western pine beetle and Jeffrey pine beetle, occurred throughout southern Idaho and western Nevada.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Pinyon pine engraver beetle *Ips confusus*	Pinyon pine	Utah	Scattered pockets of mortality caused by this insect were found on the Dixie and Fishlake National Forests and in the Book Cliff area on BLM administered lands.
Ponderosa pine needleminer *Coleotechnites moreonela*	Ponderosa pine	Idaho	Mining of older needles on ponderosa pines on approximately 800 acres near Featherville, Idaho, was detected during aerial surveys.
Silver fir beetle *Pseudohylesinus sericeus*	Grand fir	Idaho	Large populations of this beetle were found overwintering in root collars of grand firs from Smith's Ferry to McCall, Idaho. Infestation did not cause tree mortality.
Spotted aspen leafroller *Siaphila duplex*	Aspen	Wyoming	Defoliation by this insect was observed on aspen in the town of Big Piney, Wyoming.
Spruce beetle *Dendroctonus rufipennis*	Spruce	Idaho, Utah, Wyoming	Decreases in activity occurred in southern Idaho where mortality decreased from 185,500 trees in 1990 to 23,800 trees in 1991. Most of this decline in mortality occurred on the Payette National Forest, the only Forest in southern Idaho with significant spruce beetle activity. In Utah, spruce beetle killed 16,900 trees with increasing mortality levels on the Manti-LaSal National Forest and a new infestation detected on the Dixie National Forest. On the Bridger-Teton National Forest in western Wyoming 800 trees were killed, an increase from 1990. Regionwide, 41,500 trees were killed during 1991.
Spruce seed moth *Laspeyresia youngman*	spruce	Utah	Moderate populations were found infesting cones on the Fishlake National Forest in Utah.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Sugar pine tortrix *Choristoneura lambertiana*	Pines	Idaho	Light to moderate defoliation of lodgepole pines occurred in scattered 5-10 acre pockets on the Salmon National Forest, Idaho.
Western balsam bark beetle *Dryocoetes confusus*	Subalpine fir	Idaho, Utah, Wyoming	Increases in mortality occurred Regionwide with 244,400 dying subalpine fir observed. In southern Idaho 118,100 trees were killed and extensive areas of the Caribou, Sawtooth and Targhee National Forests are infested. Smaller infestations are present on the Boise, Challis and Salmon National Forests. In Utah 41,800 trees were killed: mortality is located on the Manti-LaSal, Uinta, and Wasatch-Cache National Forests. On the Bridger-Teton National Forest in western Wyoming 84,500 trees were killed.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Idaho	Beetle populations continued to collapse on the Boise and Payette National Forests with only 8,200 trees killed during 1991 compared to 23,800 trees in 1990.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, true firs	Idaho	Defoliation levels remained static with 49,300 acres defoliated in 1991 compared to 42,900 acres in 1990. All aerially visible defoliation occurred in southern Idaho. Most defoliation is located on the Salmon National Forest while smaller infestations are located on the Challis and Targhee National Forests. Defoliation intensity was classified as mostly light. Light defoliation was observed during ground surveys on the Fishlake National Forest in southern Utah.

Status of insects in southern Idaho, Nevada, Utah, and western Wyoming

Insect	Host	Location	Remarks
Western tent caterpillar *Malacosoma californicum*	Cottonwoods	Utah	Heavy defoliation on cottonwoods at Otter Creek State Park resulted in topkill and branch mortality of many trees within the park.
Willow leaf bettle *Altica bimarginatana*	Willow	Nevada	Stands of willow were defoliated by this leaf beetle north of Merritt Mountain on the Mountain City Ranger District.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Aspen trunk rot *Phellinus tremulae*	Aspen	Idaho, Nevada, Utah, Wyoming	Decay occurs in most aspen stands in the Region.
Comandra blister rust *Cronartium comandrae*	Lodgepole, Ponderosa pine	Idaho, Utah, Wyoming	Infection occurs infrequently throughout Idaho and Utah. Heavy, localized areas of infection resulting in branch, top and entire tree mortality of sapling-size ponderosa pines occurred in southeastern Idaho. In Wyoming, infection frequently occurred in all size classes of lodgepole pine.
Pinyon blister rust *Cronartium occidentale*	Pinyon pine	Idaho, Utah	This disease was observed on the Moab Ranger District, Manti-LaSal National Forest, Utah and in the Raft River Mountains on the Sawtooth National Forest, Idaho.
Cytospora canker of true firs *Cytospora abietis*	True firs	Idaho, Utah, Wyoming	Branch flagging, top-killing and mortality attributed to this canker occurred in localized areas throughout host type. Increasing levels of infection were observed and significant mortality occurred in southern Idaho, southern Utah and western Nevada.
Canker of subalpine fir (unidentified)	Subalpine fir	Idaho	Branch flagging, top-killing and mortality attributed to this canker occurred in localized areas throughout host type. Increasing levels of infection were observed and significant mortality occurred in southern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Dwarf mistletoes *Arceuthobium spp.*	Douglas-fir, Lodgepole pine, Ponderosa pine, Western larch, Jeffrey pine, True firs	Idaho, Wyoming, Utah Nevada	Suppression projects continue to remove infected overstory trees, however this forest pest remains the most widespread and frequently observed pest within the Intermountain Region.
True mistletoe on Juniper *Phoradendron juniperinum*	Junipers	Utah, Nevada	This pest occurs on juniper on the Fishlake and Dixie National Forests in Utah and in the Great Basin National Park in Nevada.
Limb rust *Peridermium filamentosum*	Ponderosa pine	Utah	Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.
Red ring rot *Phellinus pini*	Western larch, True firs, Spruce, Douglas-fir, Pines	Idaho, Utah, Wyoming	Infection intensity varies throughout stands in the Region.
Rust-red stringy rot *Echinodontium tinctorium*	Grand fir, White fir, Subalpine fir	Idaho, Nevada, Utah	Decay caused by this fungus is common in mature and overmature stands of true firs.
Stalactiform blister rust *Cronartiumn coleosporiodes*	Lodgepole pine	Idaho, Utah, Nevada	This rust occurred in localized areas throughout the host type. Heavy infection has been noted in localized areas on the Salmon, Sawtooth and Targhee National Forests in Idaho.
Other stem decays	All tree species	Idaho, Utah, Nevada, Wyoming	A large number of minor stem decay agents too numerous to list occur with varying intensity throughout the Region.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Idaho, Utah, Wyoming	Gall rust occurs extensively within the host types. Varied infection levels are observed with localized heavy infection levels present in both host species.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Root Diseases			
Annous root disease *Heterobasidion annosum*	Douglas-fir, Engelmann spruce, Lodgepole pine, Ponderosa Pine, Jeffrey Pine, True firs	Idaho, Nevada, Utah, Wyoming, California	Infection causes varying amounts of root and butt rot in mature individuals of many tree species, and may result in predisposition to beetle attack. Infection-induced mortality occurs frequently in young ponderosa pine and infrequently in Douglas-fir, subalpine fir, red fir and white fir.
Armillaria root disease *Armillaria* sp.	Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir	Idaho, Nevada, Utah, Wyoming	Evidence of Armillaria can be found throughout the Region. In southern Idaho, northern Utah, Nevada, and Wyoming, it functioned primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, in some cases, it acts as a primary pathogen killing mature and immature ponderosa pine and mature fir and spruce.
Black stain root disease *Ophiostoma wageneri, (=Ceratocystis wagenerii)*	Pinyon pine	Idaho, Nevada, Utah	This fungus causes mortality of pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forest in Utah.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Schweinitzii butt rot *Phaeolus schweinitzii*	Douglas-fir, Ponderosa pine	Idaho	Decay is common in mature and overmature forests throughout the host type, especially those having a fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity.
Tomentosus root disease *Inonotus tomentosus*	Douglas-fir, Spruce, Subalpine fir	Idaho, Utah	This fungus is found alone or associated with P. Schweinitzii causing root and butt rot of pole-size and larger trees in southern Idaho. In southern Utah, it kills pole-sized and larger spruce in progressively enlarging disease centers.
Artist's conk *Ganoderma applanatum*	Aspen	Idaho, Nevada, Utah, Wyoming	This pathogen is commonly observed in association with wind-thrown aspen on the Dixie and Fishlake National Forests in Utah.
Foliage Diseases			
Conifer - Aspen rust **Conifer - Cottonwood rust** *Melampsora medusae* *Melampsora occidentalis*	Aspen, Conifers, Cottonwood	Idaho	Infected cottonwood and aspen were commonly observed in southern Idaho. Some aspen clones were severely defoliated by these fungi. Limited infection of the alternate host conifers was observed.
Douglas-fir needle cast *Rhabdocline* spp.	Douglas-fir	Idaho	Incidence decreased with light infection noted throughout the range of Douglas-fir in southern and eastern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Elytroderma disease *Elytroderma deformans*	Ponderosa pine	Idaho	Systemic infections occur throughout the host type and are especially severe in southwestern Idaho. Except in the systemic "brooms," new foliage discoloration caused by this fungus decreased in 1991.
Incense cedar broom rust *Gymnosporangium libocedri*	Incense cedar	Nevada, California	This disease occurs in isolated patches of host trees on the Toiyabe National Forest, Nevada, California.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Idaho, Nevada, Utah, Wyoming	Infections occur throughout the host's range. Infection intensity varies significantly.
Fir needle cast *Lirula* spp.	Subalpine fir, Grand fir	Idaho	Infection occurred at endemic levels throughout the host type.
Fir needle rust *Pucciniastrum* sp.	Subalpine fir	Idaho	Seedling and sapling size trees throughout the host type were variably infected. At higher elevations around McCall, Idaho, hosts were heavily infected.
Larch needle cast *Meria laricis*	Western larch	Idaho	Incidence and severity of infection in west central Idaho were very light. Detection was confounded by severe frost damage that occurred shortly after spring needle flush.
Marssonia blight *Marssonina populi*	Aspen	Idaho, Utah, Wyoming	Scattered incidence of moderate to heavy intensity was noted throughout most of the hosts range in southern Idaho, northern Utah, and western Wyoming.
Shepherd's crook *Venturia macularis*	Aspen	Idaho	Scattered but increasing incidence of light to moderate intensity was noted in southern Idaho.

Status of diseases in southern Idaho, Nevada, Utah, and western Wyoming

Disease	Host	Location	Remarks
Spruce broom rust *Chrysomyxa* spp.	Engelmann spruce	Idaho, Utah, Wyoming	Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.
Nursery Diseases			
Fusarium root disease *Fusarium oxysporum*	*Abies* spp., Douglas-fir, Ponderosa pine	Idaho	This fungus caused caused small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho.
Fusarium cortical stem rot *Fusarium avenaceum*	*Abies* spp., Douglas-fir, Ponderosa pine	Idaho	This fungus caused scattered mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho.
Phytophthora/Pythium root rot *Phytophthora* spp., *Pythium* spp.	Douglas-fir, Spruce	Idaho	These fungi occur on seedlings and in soil at the Lucky Peak Nursery, Boise National Forest, Idaho. Infection results in mortality and culling of 2-0 seedlings.
Abiotic			
Drought effects	All vegetation	Regionwide	Premature needle drop, leaf scorch, and seedling mortality were observed due tofive consecutive years of below normal precipitation.
Spring Frost	Western Larch	Idaho	An early spring frost killed foliage on the Payette National Forest, Idaho.
Winter Drying	Ponderosa pine	Utah	Locally heavy patches of damage and mortality occurred on the Flaming Gorge Ranger District, Ashley National Forest and on the Cedar City Ranger District, Dixie National Forest.

TABLE 1.---*Number of trees killed and acres infested by bark beetle in Region 4 during 1991 as determined by aerial detection surveys.*

	Mountain Pine Beetle		Douglas-fir Beetle		*Ips*/Western Pine Beetle		Spruce Beetle		Fir Engraver Beetle		Western Balsam Bark Beetle		Jeffrey Pine Beetle		Totals	
Forest*	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley	400	400	200	100	--	--	--	--	--	--	--	--	--	--	600	500
Boise	6,000	3,000	27,900	26,500	7,200	7,400	--	--	7,600	13,300	6,200	9,000	--	--	54,900	59,200
Bridger-Teton	1,700	1,400	8,500	8,500	--	--	800	900	--	--	84,500	84,300	--	--	95,500	95,100
Caribou	200	200	2,400	1,900	--	--	--	--	--	--	52,500	39,900	--	--	55,100	42,000
Challis	5,500	3,200	1,000	800	--	--	--	--	--	--	400	300	--	--	6,900	4,300
Dixie	900	700	--	--	--	--	1,600	1,200	--	--	100	100	--	--	2,600	2,000
Fishlake	--	--	--	--	--	--	100	100	--	--	--	--	--	--	100	100
Manti-LaSal	300	200	--	--	--	--	14,400	8,100	--	--	11,200	8,400	--	--	25,900	16,700
Payette	1,800	1,700	16,000	19,200	1,000	2,100	23,800	36,100	5,100	5,100	--	--	--	--	47,700	64,200
Salmon	200	100	7,600	7,300	--	--	--	--	--	--	700	700	--	--	8,500	8,100
Sawtooth	15,000	9,600	10,200	8,200	--	--	--	--	--	--	17,700	17,200	--	--	42,900	35,000
Targhee	1,700	1,400	15,300	13,800	--	--	--	--	--	--	40,600	19,800	--	--	57,600	35,000
Toiyabe	--	--	--	--	--	--	--	--	193,000	70,300	--	--	2,900	5,300	195,900	75,600
Uinta	--	--		--	--	--	100	100	--	--	7,200	7,200	--	--	7,300	7,300
Wasatch-Cache	--	--	700	600	--	--	700	700	43,700	29,800	23,300	20,600	--	--	68,400	51,700
TOTAL	33,700	21,900	89,800	86,900	8,200	9,500	41,500	47,200	249,400	118,500	244,400	207,500	2,900	5,300	669,900	496,800

* *Only portions of Forests and adjacent land flown; actual mortality figures are probably considerably higher.*

TABLE 2.---*Status of* ***mountain pine beetle*** *infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	16.3	25.8
Other Federal	0.6	0.9
State and Private	0.3	3.7
TOTAL	19.2	30.4

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	1.1	1.4
Other Federal	0.1	0.1
State and Private	0.1	0.1
TOTAL	1.3	1.6

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	1.2	1.5
Other Federal	0.2	0.2
State and Private	0.0	0.0
TOTAL	1.4	1.7

TABLE 3.---*Status of* ***spruce beetle*** *infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	33.9	21.8
Other Federal	1.1	1.0
State and Private	1.1	1.0
TOTAL	36.1	23.8

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	9.7	15.7
Other Federal	0.0	0.0
State and Private	0.5	1.2
TOTAL	10.2	16.9

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.9	0.8
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.9	0.8

TABLE 4.---*Status of* ***Douglas-fir beetle*** *infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	66.0	69.9
Other Federal	2.4	3.3
State and Private	9.3	7.2
TOTAL	77.7	80.4

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	0.7	0.9
Other Federal	0.0	0.0
State and Private	0.0	0.0
TOTAL	0.7	0.9

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	7.6	7.6
Other Federal	0.5	0.5
State and Private	0.4	0.4
TOTAL	8.5	8.5

TABLE 5.---*Status of* ***western pine beetle*** *infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	7.6	6.4
Other Federal	0.0	0.0
State and Private	1.9	1.8
TOTAL	9.5	8.2

TABLE 6.---*Status of* ***Jeffrey pine beetle*** *infestations by state during 1991.*

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	3.7	2.0
Other Federal	0.0	0.0
State and Private	1.6	0.9
TOTAL	5.3	2.9

TABLE 7.---*Status of* ***western balsam bark beetle*** *infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	80.1	109.8
Other Federal	3.4	4.1
State and Private	3.4	4.2
TOTAL	86.9	118.1

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	34.5	37.6
Other Federal	0.9	2.1
State and Private	0.9	2.1
TOTAL	36.3	41.8

WYOMING

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	79.7	80.0
Other Federal	1.6	2.0
State and Private	3.0	2.5
TOTAL	84.3	84.5

TABLE 8.---*Status of **fir engraver beetle** infestations by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	15.6	10.8
Other Federal	0.0	0.0
State and Private	2.8	1.9
TOTAL	18.4	12.7

NEVADA

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	58.3	160.2
Other Federal	3.5	9.6
State and Private	8.5	23.2
TOTAL	70.3	193.0

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
National Forest	28.3	40.6
Other Federal	0.0	0.0
State and Private	1.5	3.1
TOTAL	29.8	43.7

TABLE 9.---*Acres of defoliation by* ***Douglas-fir tussock moth*** *in Region 4 during 1991 as determined by aerial detection surveys.*

Forest and Adjacent Land	Defoliation Intensity			
	Light	Moderate	Heavy	TOTAL
Boise	59,600	47,100	102,600	209,300
Payette	700	1,000	16,800	18,500
Sawtooth	14,800	16,200	38,200	69,200
Owyhee County	0	0	15,000	15,000
Wasatch-Cache	1,900	200	2,800	4,900
R-4 TOTALS	77,000	64,500	175,400	316,900

TABLE 10.---*Status of* ***Douglas-fir tussock moth*** *defoliation by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)
National Forest	287.5
Other Federal	12.2
State and Private	12.3
TOTAL	312.0

UTAH

Land Ownership Class	Outbreak Area (Thousand Acres)
National Forest	4.2
Other Federal	0.0
State and Private	0.7
TOTAL	4.9

TABLE 11.---*Acres of defoliation by* ***western spruce budworm*** *in Region 4 during 1991 as determined by aerial detection surveys.*

	Defoliation Intensity			
Forest and* Adjacent Land	Light	Moderate	Heavy	TOTAL
Challis	2,200	0	0	2,200
Salmon	44,300	1,900	0	46,200
Targhee	900	0	0	900
R-4 TOTALS	47,400	1,900	0	49,300

*Only portions of Forests flown; actual acreage may be greater.

TABLE 12.---*Status of* ***western spruce budworm*** *defoliation by state during 1991.*

IDAHO

Land Ownership Class	Outbreak Area (Thousand Acres)
National Forest	49.3
Other Federal	0.0
State and Private	0.0
TOTAL	49.3

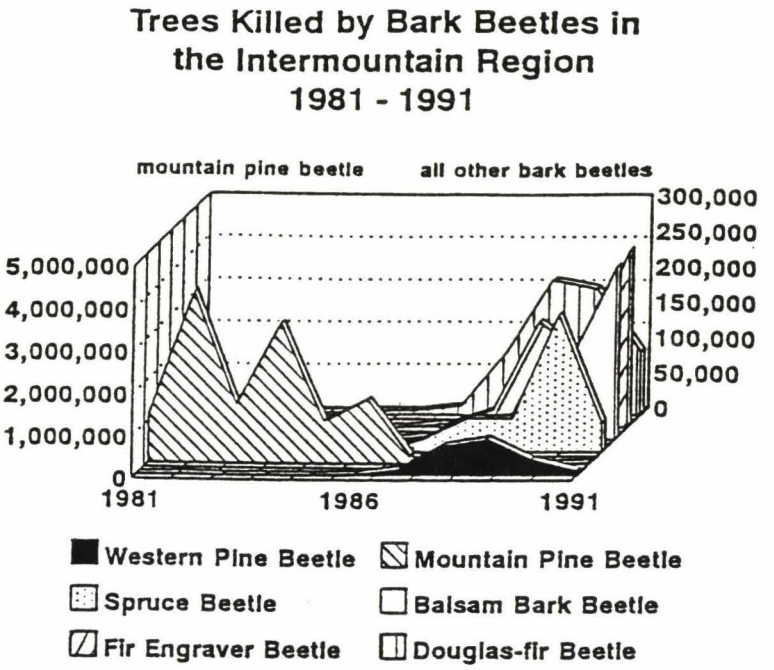


Figure 1. Bark beetle activity in Region 4 from 1981 to 1991 as determined by aerial detection surveys.

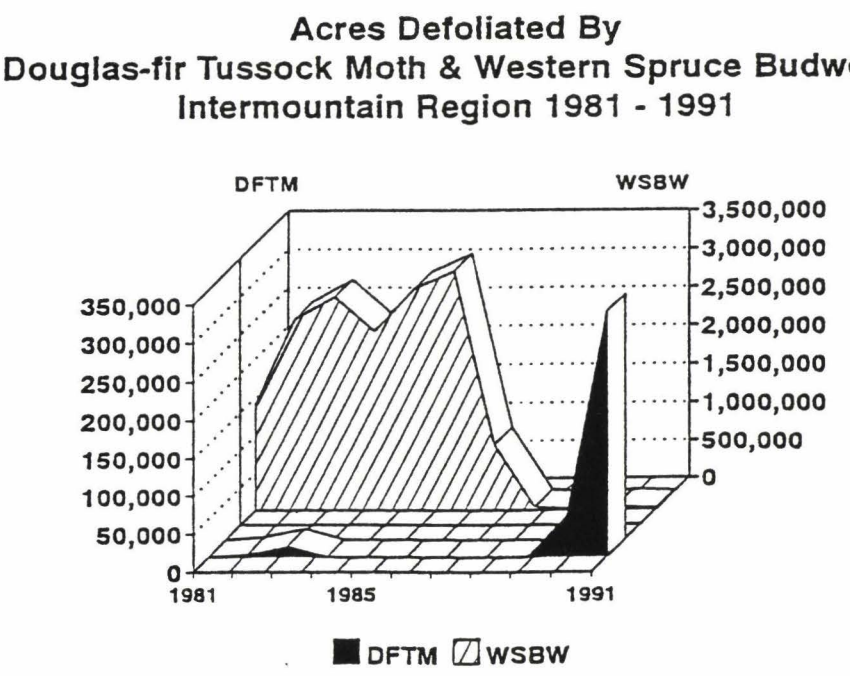
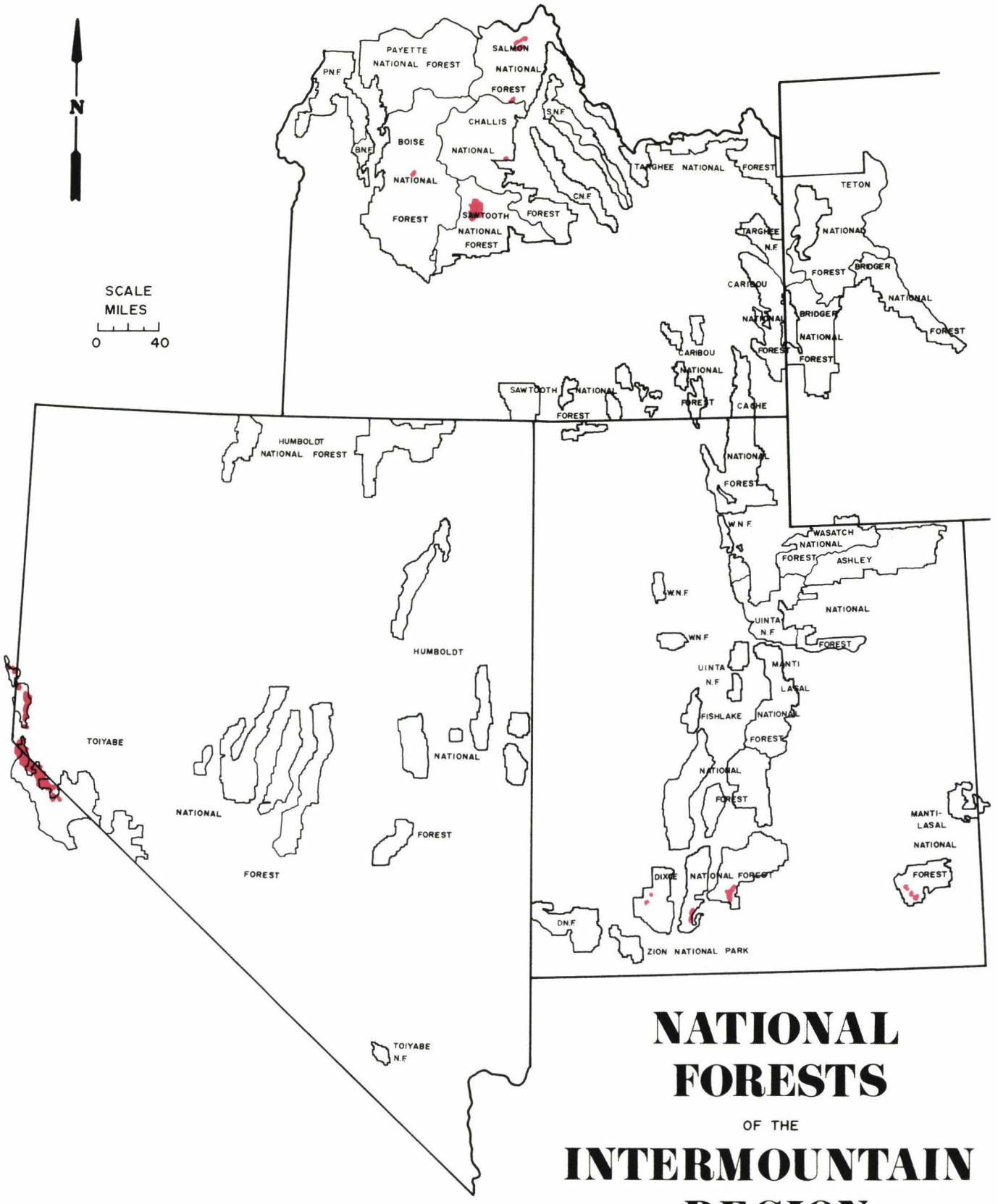


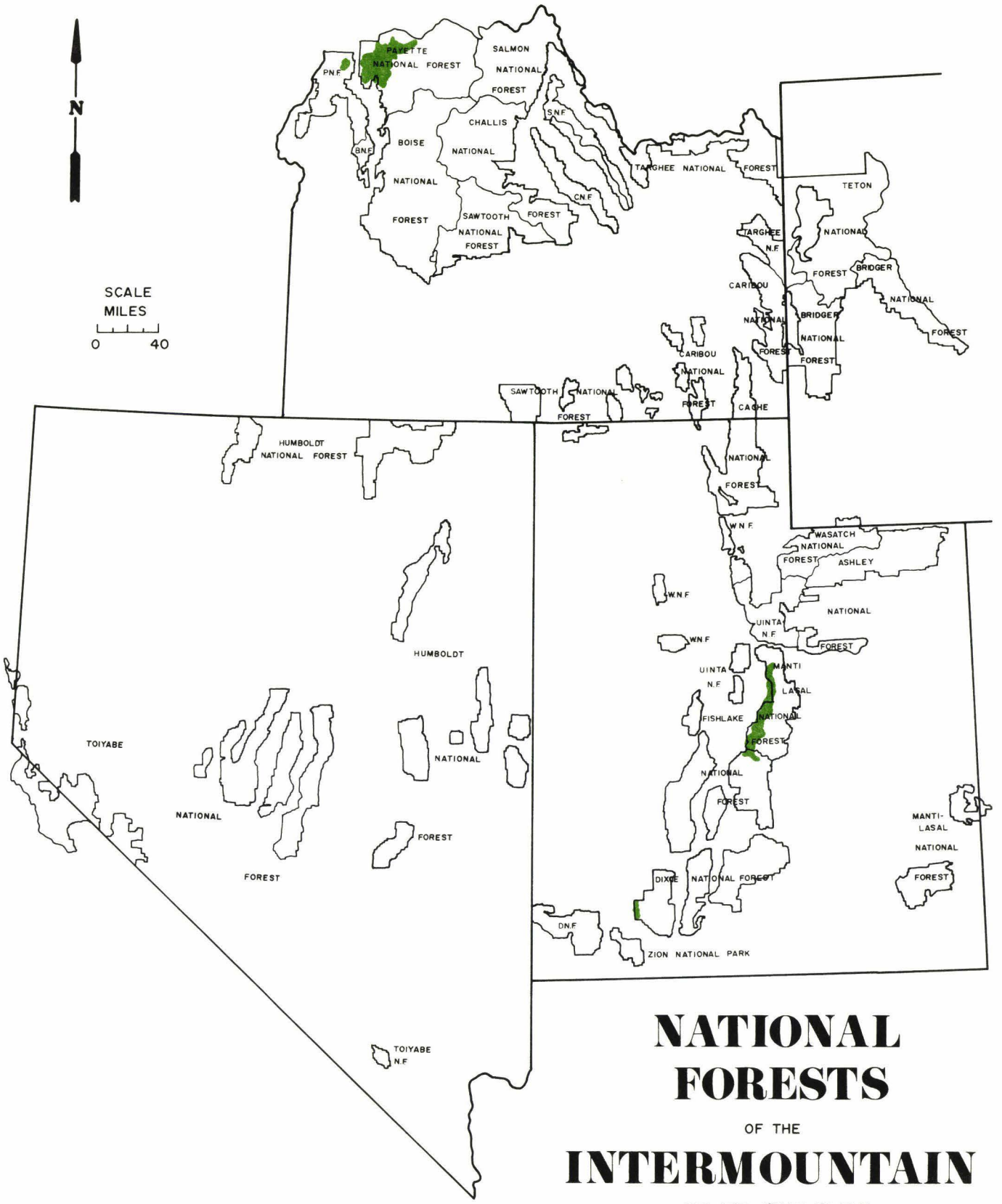
Figure 2. Defoliator activity in Region 4 from 1960 to 1991 as determined by aerial detection surveys.

Figure 3. Areas infested by mountain pine beetle and Jeffrey pine beetle in Region 4 during 1991 as observed during aerial detection surveys.



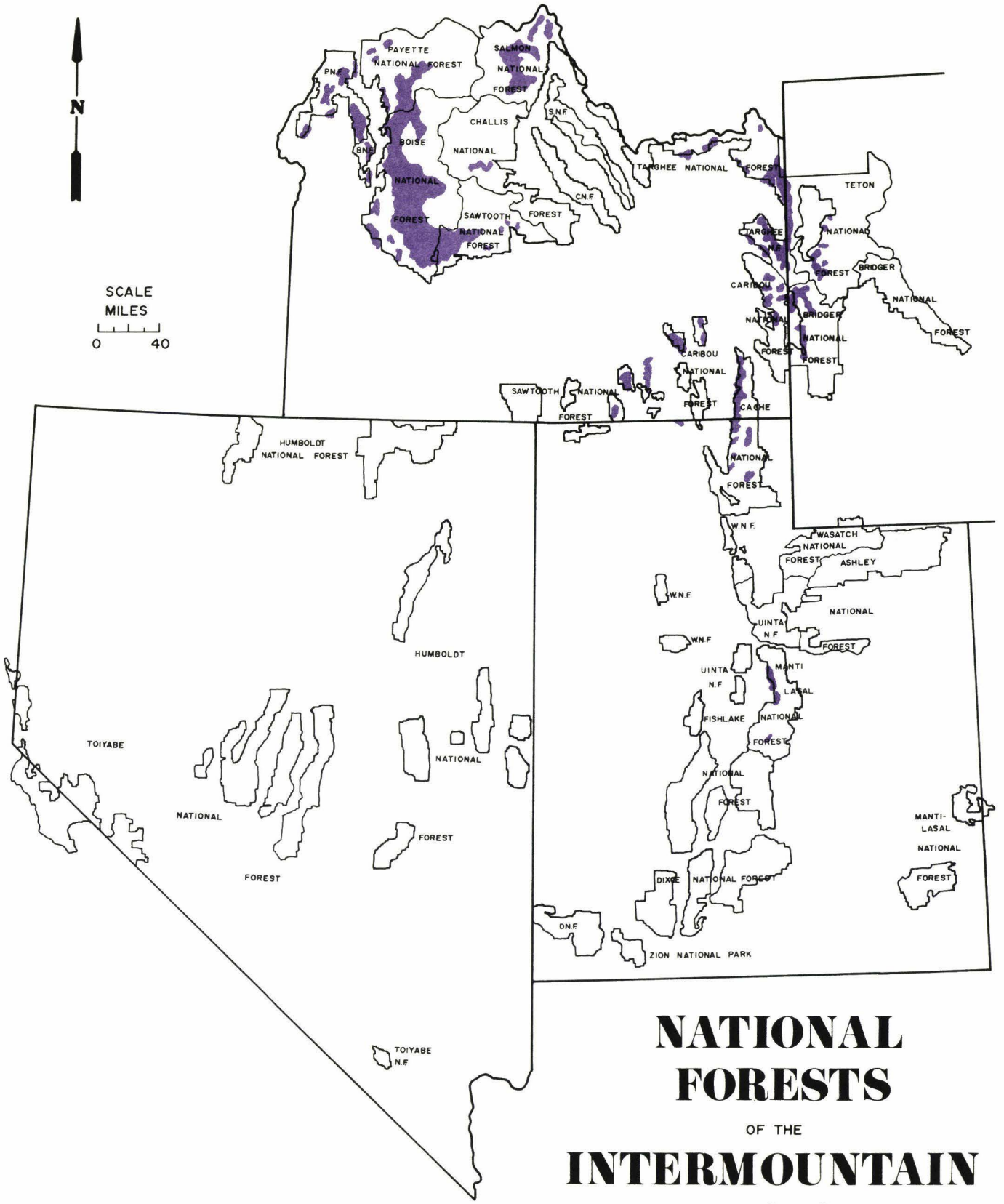
NATIONAL FORESTS OF THE INTERMOUNTAIN REGION

Figure 4. Areas infested by spruce beetle in Region 4 during 1991 as observed during aerial detection surveys.



NATIONAL FORESTS OF THE INTERMOUNTAIN REGION

Figure 5. Areas infested by Douglas-fir beetle in Region 4 during 1991 as observed during aerial detection surveys.



NATIONAL FORESTS OF THE INTERMOUNTAIN REGION

Figure 6. Areas infested by western pine beetle and pine engraver beetles in Region 4 during 1991 as observed during aerial detection surveys.

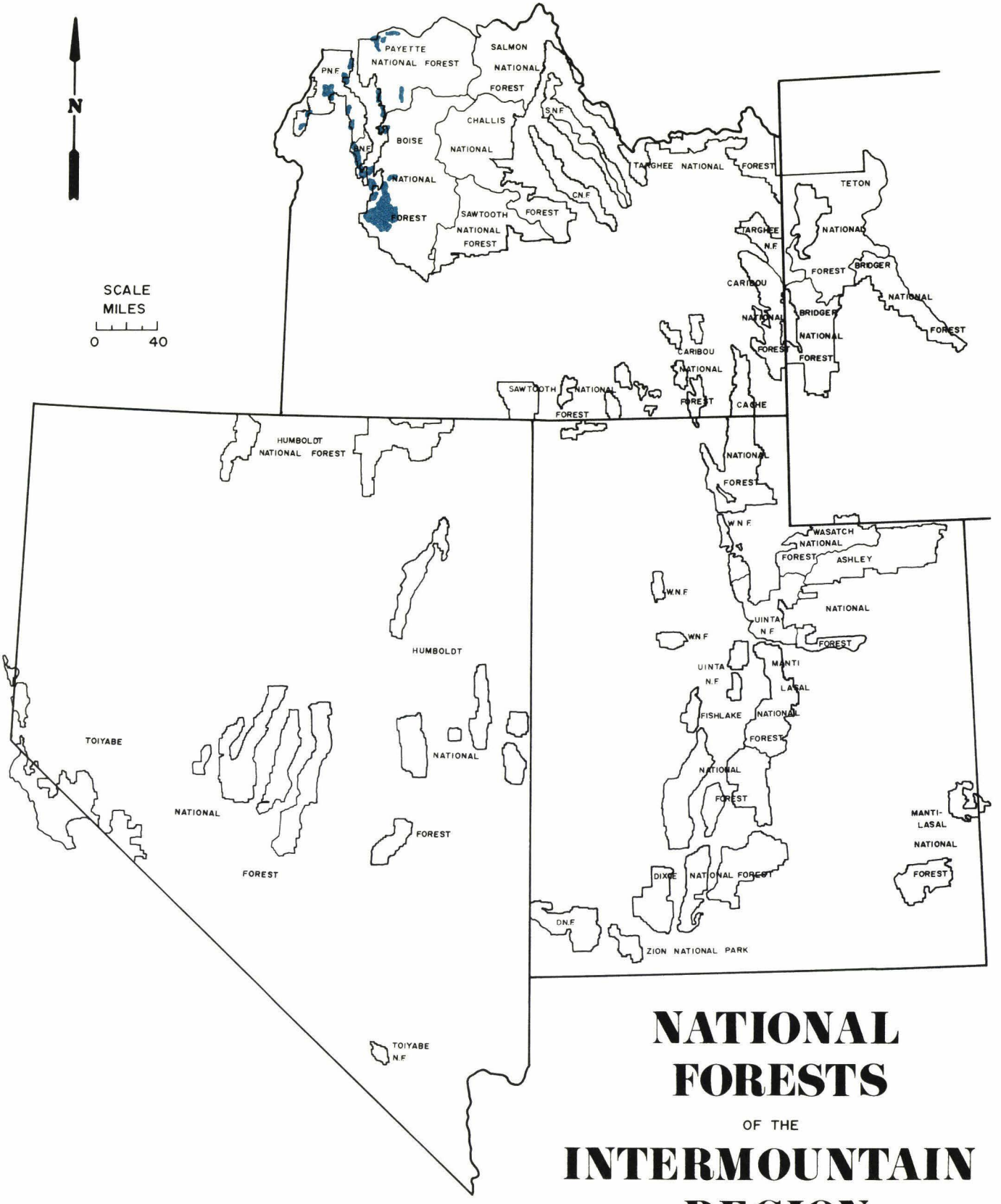
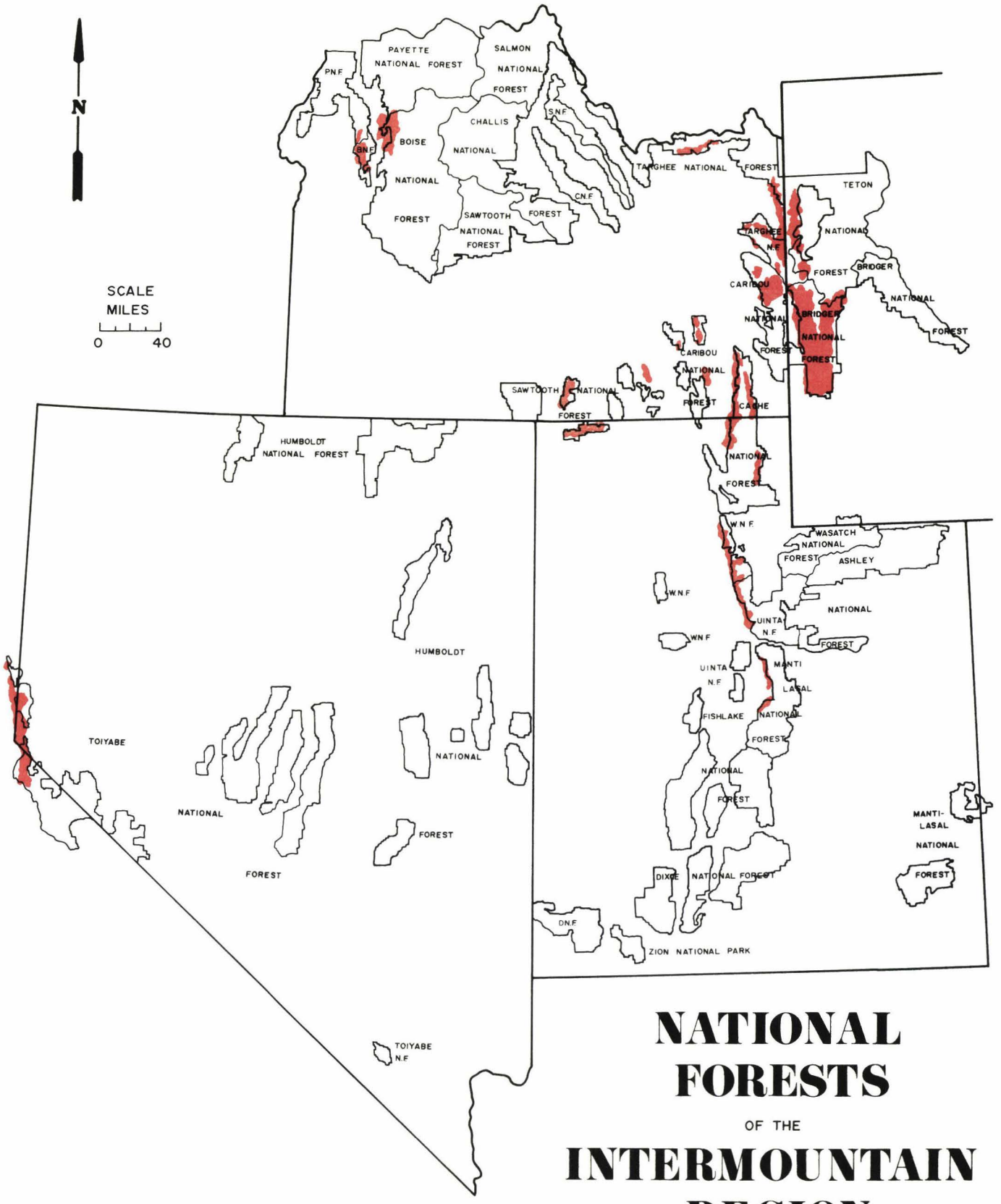
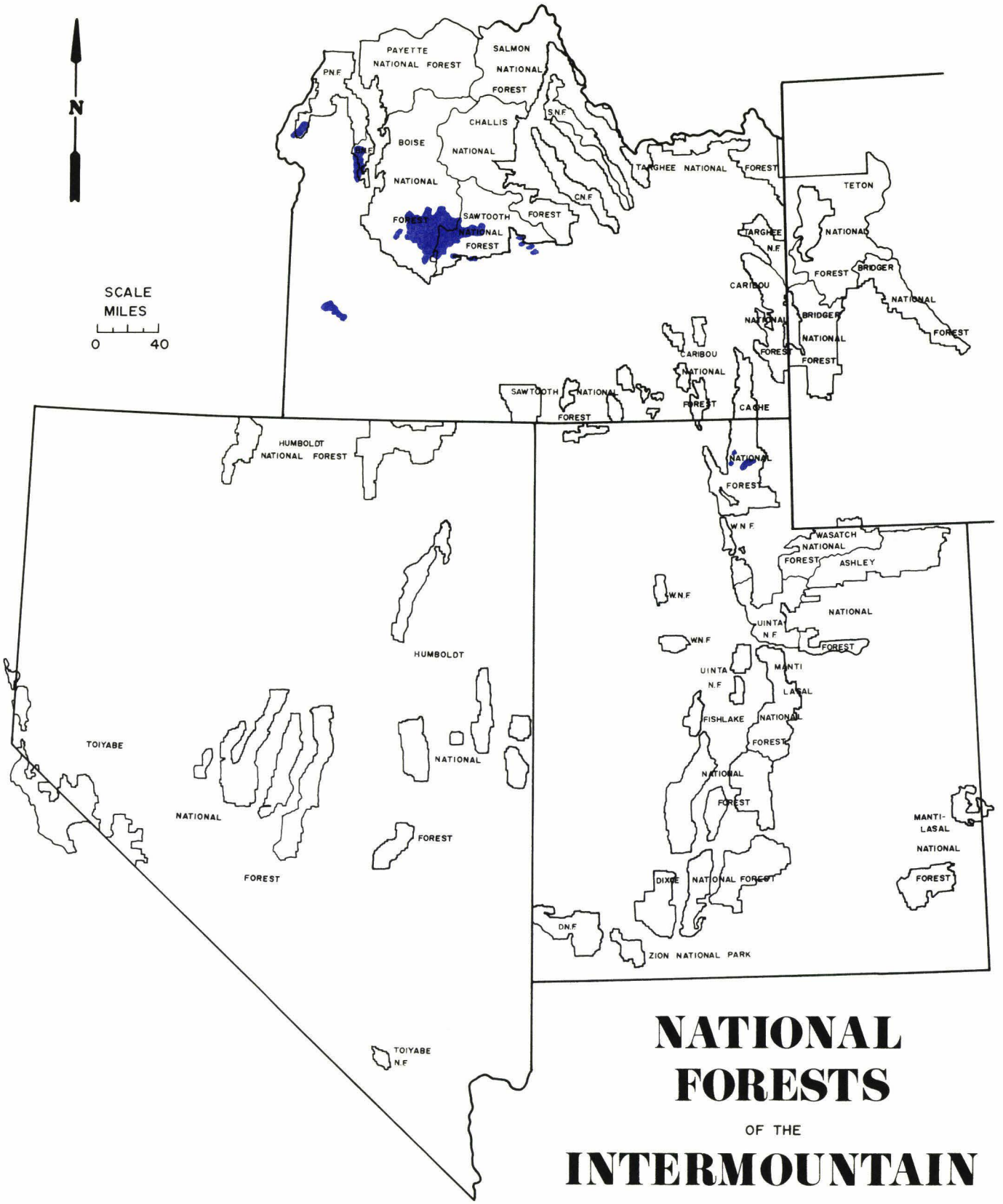


Figure 7. Areas infested by fir engraver beetle and western balsam bark beetle in Region 4 during 1991 as observed during aerial detection surveys.



NATIONAL FORESTS OF THE INTERMOUNTAIN REGION

Figure 8. Areas infested by Douglas-fir tussock moth in Region 4 during 1991 as observed during aerial detection surveys.



SPECIAL PROJECT UPDATE

Field Test of TM BioControl-1. A rate test of TM BioControl-1 was conducted on the Boise National Forest near Featherville, Idaho, during 1991. Aerial applications were completed during early July. Coverage appears to be satisfactory. Preliminary results were not encouraging.

Douglas-fir Tussock Moth Mating Disruption Pilot Test. This test was intended to demonstrate the feasibility of using a mating disruption technique as an operational suppression tactic. Pheromone loaded in fibers and mixed with a sticker was applied via helicopter to 600 acres in the Manns Creek drainage on the Weiser Ranger District, Payette National Forest. Preliminary results were encouraging.

Special Research Project to Evaluate Mountain Pine Beetle Response to Different Verbenone Dosages in Lodgepole Pine Stands. A cooperative field test of various rates of verbenone, a bark beetle antiaggregative semiochemical, was installed by personnel from Forest Pest Management and the Intermountain Research Station during 1991 in the Sawtooth National Recreation Area. This test was designed to determine an optimum treatment rate to prevent mountain pine beetle infestations in lodgepole pine stands. Treatment rates of 20 and 40 verbenone bubble caps per acre were deployed. Results were not encouraging.

Semiochemical Baiting for Spruce Beetle. Seven replicates consisting of controls, two baits per acre and five baits per acre, were established on the Heber and Evanston Ranger Districts on the Uinta and Wasatch-Cache National Forests, respectively. Data analysis is currently being conducted. Preliminary results indicated that the average number of infested trees between treatments differ significantly.

Semiochemical Baiting Efficiency for Western Pine Beetle. This project attempted to show differences exist for semiochemical baiting densities for western pine beetle. One-acre plots were treated with 0, 2, or 5 baits, and beetle attack was evaluated. Beetle populations in the project area were too low to measure effect.

Evaluation of a Semiochemical Pine Engraver Beetle Repellent. This cooperative project tested the effects of a mixture of verbenone and ipsenol to prevent pine engraver beetle infestation of ponderosa pine slash. Less slash was infested on the treated plots and attack density was significantly reduced.

A Field Test of the Efficacy of MCH in Preventing Douglas Beetle Infestation in Douglas-fir. This completed project attempted to test the influence of MCH on tree infestation by Douglas-fir beetle. Beetle populations in the study area were too low for measurable results.

Evaluation of Global Positioning Systems for Gypsy Moth Detection Surveys. Successful trap retrieval was affected by locational variability caused by topography, vegetative cover, satellite array, selective availability, and user proficiency. Two years of data have been analyzed, and a draft report is in progress. A manuscript will be submitted to the Methods Application Group for publication.

Data Visualization of Forest Management Issues on the Dixie National Forest. Insect damage and management alternative scenarios with expected impacts are being developed for four sites on the Dixie National Forest in Utah. Visual simulations will be developed for various times from immediate post management to 60 years from initial infestation. This process will initiate development of a public perception model addressing insect impacts and management responses.

Permanent Plots to Validate the Dwarf Mistletoe Extension of PROGNOSIS MODEL. The purpose of this ongoing, westwide project is to establish a database to validate and calibrate the dwarf mistletoe model linked to the PROGNOSIS model for stand development. Eight new permanent plots were installed on the Dixie, Sawtooth, Caribou, and Wasatch-Cache National Forests; and, the permanent inventory plot system from two national forests were evaluated.

Validation Project for Mountain Pine Beetle Extension of PROGNOSIS MODEL. Validation and statistical analysis have been completed on data from 35 stands on the Ashley and Wasatch-Cache National Forests. Field data following a mountain pine beetle outbreak were compared to PROGNOSIS predictions. Statistically, the model failed to significantly project tree losses for smaller size classes of lodgepole pine in the study area. A manuscript is being submitted for a Methods Application Group publication.

RECENT PUBLICATIONS

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Filip, G; Hoffman J. Root disease management in western-montane forest soils. *In* Proceedings of: Symposium on management and productivity of western-montane forest soils. Holiday Inn, Boise, ID. April 10-12, 1990. USDA Forest Service, Intermountain Research Station, Moscow, ID. General Technical Report, INT-280. 1991. 254 p.

Parks, C; Hoffman, J. Control of western dwarf mistletoe with the plant-growth regulator Ethephon. USDA Forest Service, Pacific Northwest Research Station, LaGrande, OR. Research Note, PNW-RN-506. August 1991. 4 p.

Knapp, A; Weatherby, J; Hoffman, J; Hansen, D; LaMadeleine, L; Williams, R. 1991. Forest Insect and Disease Conditions, Intermountain Region 1990. FPM Report. Ogden, UT: USDA Forest Service, Intermountain Region. 33 p.

Mocettini, P. 1991. Spruce beetle population trend on the Payette National Forest, Idaho. FPM Report. Ogden UT: USDA Forest Service, Intermountain Region. 5 p.

Munson, A. 1991. Utah gypsy moth eradication program. 1990 report. Tree Leaves. Volume 15, No. 2. 3 p.

Thier, R.; and Weatherby, J. 1991. Mortality of Douglas-fir after two semiochemical baiting treatments for Douglas-fir beetle. (Coleoptera: Scolytidae). J. Econ. Entomol. 84(3):962-964.

Weatherby, J; Cahill, D. 1990. Western spruce budworm silvicultural demonstration area, Payette National Forest. FPM Report. Ogden UT: USDA Forest Service, Intermountain Region. 12 p.

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Weatherby, J. 1991. Mechanical methods and chemical control. *In* Proceedings of the Workshop on Exotic Aphid Pests of Conifers: A crisis in African Forestry. Kenya Forestry Research Institute, Muguga, Kenya. pp. 117-120.